Form PTO-1390 (Rev. 1-98) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

Attorney's Docket Number: 44471-254367 (13700)

U.S. Application No. (if known, see 37 CFR 1.5): 09/786138

International Application No.	International Filing Date	Priority Date Claimed
PCT/JP00/04262	28 June 2000 (28.06.00)	28 June 1999 (28.06.99)

Title of Invention

COMPRESSED-CODE GENERATING METHOD AND COMPRESSED-CODE EXPANDING METHOD

Applicant(s) for DO/EO/US

SHONO, Katsufusa; ABE, Takahiro

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Other items or information:

U.S. Application No. (if known, see 37 CFR 1.5)	International Application No.	Attorney's Docket Number
09/786138	PCT/JP00/04262	44471-254367 (13700)

17. ☒ The following fees are submitted: CALCULATIONS PTO USE ONLY

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO $970.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO $840.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO $760.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) $670.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) $96.00

ENTER APPROPRIATE BASIC FEE AMOUNT =				$840	
Surcharge of $130.00 for furnishing the oath or declaration later than ☒ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				$130	
Claims	Number Filed	Number Extra	Rate		
Total claims	2 - 20 =	0	x 18.00	$0	
Independent Claims	1 - 3 =	0	x 78.00	$0	
Multiple Dependent Claims (if applicable)			+ 260.00	$	
TOTAL OF ABOVE CALCULATIONS =				$970	
Reduction of 1/2 for filing by small entity, if applicable. Applicant claims small entity status. -				$	
SUBTOTAL =				$970	
Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$	
TOTAL NATIONAL FEE =				$970	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +				$	
TOTAL FEES ENCLOSED =				$970	
				Amount to be refunded:	$
				charged:	$

a. ☒ A check in the amount of $970 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. 11-0855 in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 11-0855. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:
Roger T. Frost
Kilpatrick Stockton, LLP
2400 Monarch Tower, 3424 Peachtree Road, N.E.
Atlanta, Georgia 30326
Telephone: 404-949-2400

Roger T. Frost, Reg. No. 22,176

DESCRIPTION

COMPRESSED-CODE GENERATING METHOD AND COMPRESSED-CODE EXPANDING METHOD

Technical Field

This invention relates to a compressed-code generating method that is used for compressing information on characters including numerical data, sound and images, and a compressed-code expanding method that is used for restoring and expanding a compressed code that has been generated using this compressed-code generating method to original information.

Background Art

Information on characters including numerical data, sound and images is converted into two-value data, and is then stored in a recording medium or is transmitted to other places through a communication line, according to the needs. In this case, it is desired that the original information is efficiently compressed to meet the request for saving a memory space in the recording medium and reducing the communication traffics. The information that has been once compressed must be able to be restored and expanded to the original status for a person to be able to understand this information. When the restored expanded information coincides with the original information, this status is called that the information has been reversibly compressed/expanded. This request for a reversible compression/expansion exists in all

fields of electronics at present. However, the efficient compression and the reversible restoration expansion are generally considered as mutually contradicting requests.

The ZIP has been known as one of code compression methods for digital files. The efficiency of this method is never satisfactory.

On the other hand, the JPEG and the MPEG have been known as methods for code compressing sound and images. According to these methods, however, it is not possible to efficiently compress information, and, further, the information is lost during a compression process. When the information has been once lost during the compression process, there is no way for reproducing the lost information, and the information is deteriorated unavoidably. In other words, it is impossible to achieve the reversible restoration expansion. Therefore, there is a risk that the information obtained after repeating the compression/expansion of information by a plurality of times using the code compression methods like the JPEG and the MPEG is considerably different from the original information.

Further, it is important that noise and echoes are not removed by regarding them as meaningless information when, for example, sound information is compressed. This similarly applies to the case of compressing image information. This is because the apparently meaningless information plays an important role in many cases. Particularly, in the case of compressing sentences and numerical data as character information, meaningful data is once converted into short numerical data having no

meaning, thereby to compress the volume of information. In this case, when a 100% complete expansion is not guaranteed at the time of expanding the compressed data to recover the original meaningful information again, this information is changed to information having quite different contents or meaningless information.

Disclosure of the Invention

This invention has been made according to the above-described request for the reversible compression/expansion.

It is an object of the present invention to provide a compressed-code generating method capable of efficiently compressing information on characters including numerical data, sound and images, in consideration of a status that it is possible to reversibly expand the compressed information.

Further, it is another object of the present invention to provide a compressed-code expanding method capable of reversibly expanding a compressed code generated by using the above compressed-code generating method.

According to the compressed-code generating method and the compressed-code expanding method relating to the present invention, the original information is not deteriorated to a level at which the original information cannot be reversibly restored, even when the information has been compressed/expanded by a plurality of times.

Brief Description of the Drawing

Further characteristics and advantages of the invention of the present application will become more apparent from the following detailed explanation made with reference to the attached drawing.

Fig.1 is a diagram showing procedures of a compressed-code generating method and a compressed-code expanding method relating to the present invention. In Fig.1, arrows show a flow of a compression calculation. This shows a detailed example of a quantized initial value $Y_3(0) = 2$.

Best Mode for Carrying Out the Invention

A preferred embodiment of the present invention will be explained in detail below with reference to the attached drawing.

Prior to the explanation of the present invention, a background technique of the present invention will be made clear. Then, the explanation of the present invention will be progressed.

Logistic map

$$x(t+1) = 4x(t)\{1 - x(t)\} \quad \ldots(1)$$

Feedback

$$x(t) = x(t+1) \quad \ldots(2)$$

It has been well known that the chaos of the Riyapnoph index $\lambda = \ln 2 = 0.693 \cdots$ is generated when the above expressions (1) and (2) are calculated in a double precision 52-bit binary decimal by using a digital computer 32-bit CPU currently available. So long as the

calculation is carried out using the double precision 52-bit binary decimal, the recurrence of the calculation is guaranteed even when the calculation is carried out up to $t_{max} = 2^{20}$. In this case, x(t) means an internal status of an irrational number. The mapping of the expressions (1) and (2) can also be realized by an electronic circuit (an integrated circuit). However, the precision of the determination of the internal status x (t) is substantially lower than that obtained by using the 32-bit CPU. In this case, it is possible to take a method of observing the internal status via a nonlinear analog/digital converter.

When the internal status x(t) (where t is a discrete time, t = 0, 1, 2, · · ·) of the mapping is observed by using an in-phase conversion quantization expression

$$Y(t) = 2/\pi \times \arcsin(x(t))^{1/2} \times 2^n \quad \ldots(3)$$

Y (t) becomes a rational number, and order is observed in the chaos. An integer is included in the rational number. A quantized resolution n may be selected such that Y (t) becomes an integer. A chaos time-series Y(t)-t includes a fractal structure. The present invention utilizes the characteristics of this. In the following explanation, the in-phase conversion quantized value of the quantized resolution n is expressed as $Y_n(t)$.

When an integer Y(t) has been given, this integer can be converted into the original irrational number x(t) by using the following expression that is an inverse conversion expression of the expression (3).

$$x(t) = \{\sin \pi Y(t) / 2^{n+1}\}^2 \quad \ldots(4)$$

In the present invention, in order to make it possible to carry out the inverse compression/expansion as the object of the present invention, inverse questions of the expression (1) to (4) are set. Thus, a reversible loop consisting of the inverse calculation and the forward calculation is structured.

In general, chaos is calculated toward the future ($t > 0$). It has also been well known that the chaos generating circuit can be moved in only one future direction. On the other hand, when the irrational number $x(t)$ is obtained from the quantum $Y(t)$ as an optional integer by the expression (4), and an inverse calculation of the expression (1) is calculated as follows

$$x(t-1) = (1 \pm (1-x(t))^{1/2})/2 \quad \ldots(5)$$

it is possible to calculate a branching toward the past ($t < 0$) (an inverse calculation process). In this case, when there is no means for determining a sign of plus or minus, the number of status increases exponentially each time when the step retroactive to the past increases. Thus, it becomes impossible to cope with the situation.

The embodiment of the present invention described below shows an example of a mode that a first bit string $\{y\}_1$ obtained from an information bit string $\{y\}$ to be compressed gives a quantized initial value of the inverse calculation, and a second bit string $\{y\}_2$ plays a role of determining a sign of plus or minus of the inverse calculation. The sign of plus or minus can be determined in any manner. When it is possible to decide (select) plus or minus by any method regardless of a method of determining the sign of plus or minus, it is possible

to go back to the past while determining the status of an inverse branching.

(Embodiment)

A preferred mode of a compressed-code generating method and a compressed-code expanding method relating to the present invention will be explained below with reference to Fig.1.

At step 1, a three-bit code $\{y\}_1 = \{010\}$ is obtained from an information bit string $\{y\}$ to be compressed. Then, a quantized initial value $Y_3(0) = 2$ that becomes an integer is calculated by giving a binary weight corresponding to the three-bit code $\{y\}_1$.

At step 2, an internal status $x(0)$ that becomes an irrational number is obtained by giving an integer $Y_3(0) = 2$ and $n = 3$ to the inverse conversion expression (4) of in-phase conversion quantization respectively.

At steps 3 to 4, the calculation of the inverse calculation expression (5) of the logistic map is sequentially executed by the number of bits (six in the present embodiment) held by the second bit string $\{y\}_2$, based on the internal status (52-bit binary decimal) $x(0)$ that becomes the irrational number obtained at step 2. A sign is selected according to a value of the second bit string $\{y\}_2 = \{110011\}$ obtained from the information bit string $\{y\}$ to be compressed. Fig.1 shows one example that the bit "1" corresponds to the plus (+) sign, and the bit "0" corresponds to the minus (-) sign. This $\{y\}_2$ may be a bit string of information that continues from $\{y\}_1$, or any other selection for $\{y\}_2$ can be permitted.

Specifically, at steps 3 to 4, the internal status

x(0) that becomes an irrational number obtained at step 2 is given to the right-hand side of the inverse calculation expression (5) of the logistic map. Further, the sign "+" that follows the header value "1" in the second bit string $\{y\}_2$ is selectively given to the right-hand side of the expression (5). Thus, an internal status x(-1) retroactive to the past is obtained. Next, the internal status x(-1) retroactive to the past is given to the right-hand side of the inverse calculation expression (5) of the logistic map. Further, the sign "+" that follows the second value "1" in the second bit string $\{y\}_2$ is selectively given to the right-hand side of the expression (5). Thus, an internal status x(-2) retroactive to the past is obtained. In a similar manner, the internal statuses x(-1), x(-2), x(-3), x(-4), x(-5), and x(-6) retroactive to the past by the number of bits (six in the present embodiment) of the second bit string $\{y\}_2$ are calculated respectively.

At step 5, when the data retroactive to the sixth generation has been obtained, the in-phase conversion quantized value of the internal status x(-6) converges to an integer (= 68) plus 0.5000 · · · when the quantized resolution n = 7. The internal status x(0) that becomes an irrational number is obtained from the quantized initial value $Y_3(0)$, and the calculation of the inverse calculation expression (5) of the logistic map is executed according to the second bit string $\{y\}_2$. Thus, $Y_7(-6)$ is obtained using the in-phase conversion quantization expression (3). In this case, an integer (= 68) (this

means a value excluding 0.5) becomes a compressed code.

When the quantized initial value $Y_3(0)$ is 0, $Y_7(-8)$ becomes a converged compressed code. When the quantized initial value $Y_3(0)$ is 1, $Y_7(-5)$ becomes a converged compressed code. When the quantized initial value $Y_3(0)$ is 2, $Y_7(-6)$ becomes a converged compressed code. When the quantized initial value $Y_3(0)$ is 3, $Y_7(-5)$ becomes a converged compressed code. When the quantized initial value $Y_3(0)$ is 4, $Y_7(-7)$ becomes a converged compressed code. When the quantized initial value $Y_3(0)$ is 5, $Y_7(-5)$ becomes a converged compressed code. When the quantized initial value $Y_3(0)$ is 6, $Y_7(-6)$ becomes a converged compressed code. When the quantized initial value $Y_3(0)$ is 7, $Y_7(-5)$ becomes a converged compressed code.

In the above example, when the quantized initial value $Y_3(0)$ is 2, the three bits of the quantized initial value bit string Y_1 as the information bit string to be compressed and the six bits of the code selection bit string$\{y\}_2$ are added together to nine bits. Then, the nine bits are compressed by two bits to seven bits of the compressed code $Y_7(-6)$.

The above explains the process of generating a compressed code.

On the other hand, the expansion processing of a compressed code is a process opposite to the process of generating a compressed code. Therefore, the process opposite to the arrows shown in Fig.1 is carried out. First, an irrational number $x(-6)$ is obtained by the inverse conversion expression (4) of in-phase conversion quantization of $Y_7(-6)$. In this case, it is necessary

to have 0.500 · · · added to the integer.

An internal status value of x(0) is obtained from an irrational number x(-6) by the sequential calculation expressions (1) and (2) of the logical map. During this process, $\{y\}_2$ is restored when n=1 of the in-phase conversion quantization expression (3) is obtained.

In the in-phase conversion quantization expression (3) of the quantized initial value x(0), the binary code string three bits of the integer $Y_3(0)$ substituted with n=3 is $\{y\}_1$ that is to be restored. The original information $\{y\}_1$ and $\{y\}_2$ can be restored in this way.

In the present invention, a compression factor is not fixed. The compression factor depends on a data structure of the information to be compressed. This is one of the characteristics of a reversible compression/expansion using chaos.

In the above embodiment, after the nine-bit information {y} = (010110011) has been compressed to a seven-bit compressed code, the original information is obtained by expanding this compressed code. This is one example of carrying out a reversible compression/expansion. It is not possible to decide indiscriminately the precision of the forward and inverse calculations of an irrational number x(0), and calculation precision of the in-phase conversion quantization and inverse conversion, or how to select $\{y\}_1$ and $\{y\}_2$ for binary decimal 52 bits. These also depend on the data structure of the information to be compressed.

The in-phase conversion quantization of the logistic

map is a linear conversion of the integer Y(t) as a result. A fine structure within a linear quantum also keeps a linear relationship. Quanta (integers) are all fair including a complementary relationship. The principle of guaranteeing the complete restoration lies in this.

In the above, there has been explained one loop for obtaining $\{y\}_1$ and $\{y\}_2$ respectively from the bit string $\{y\}$ of the information to be compressed, compressing them into seven bits and expanding the compressed bits. When this method is repeatedly carried out to all other $\{y\}_1$ and $\{y\}_2$, a first compression finishes. A second compression is carried out based on a result of the first compression. Third and subsequent compressions are also carried out similarly. For restoring the original information, it is needles to mention that it is necessary to repeat the expansion by the number of repetition of the compression.

Finding a reversible loop in chaos is a necessary condition for establishing a chaos industrial technology. A chaos block encryption and a chaos stream encryption are examples to which an inter-quantum reversible process has been applied. The reversible compression/expansion using chaos according to the present invention is a chaos industrial technology that has been extended to a correspondence relationship in the quantum fine structure. This is because the nonlinear quantized observation or in-phase conversion quantization of the logistic map and the inverse conversion are the measurement of linearity of the internal status as a result.

The embodiment of the present invention is based

on the assumption that the computers available at present can calculate mantissa 52-bit binary decimals. The invention proposes the establishment of a chaos industrial technology by regarding that the computers currently available can calculate irrational numbers. However, when the calculation capacity of digital computers has improved, it is a matter of course that the various values of the present invention are rewritten to match this capacity improvement.

In the above explanation of the preferred embodiment of the invention of the present application, specific terms are used. These terms are used for the purpose of explaining the drawing. Therefore, it is needless to mention that they can be altered or revised within the range not deviating from the ideas and the scope of claims.

Industrial Applicability

As explained above, the compressed-code generating method and the compressed-code expanding method relating to the present invention can be applied to the compression and expansion of information on characters including numerical data, sound and images. Particularly, they can be applied to the information that requires a reversible compression/expansion. The present invention can exhibit particularly excellent effects in this application field.

CLAIMS

1. A compressed-code generating method that is used for compressing information on characters including numerical data, sound and images, the method comprising:

a first step of obtaining first and second bit strings $\{y\}_1$ and $\{y\}_2$ respectively from a bit string $\{y\}$ (where y is a binary code string consisting of 0 or 1) of information to be compressed;

a second step of obtaining a quantized initial value Y(0) by giving a binary weight to the first bit strings $\{y\}_1$;

a third step of obtaining an internal status x(0) that becomes an irrational value by giving the quantized initial value Y(0) and n to the right-hand side of an inverse conversion expression in-phase conversion quantization $x(0) = \{\sin \pi Y(0) / 2^{n+1}\}^2$ (where n is a quantized resolution);

a fourth step of giving the obtained internal status x(0) to the right-hand side of an inverse calculation expression of a logistic map $x(t-1) = (1 \pm (1-x(t))^{1/2})/2$ (where t is a discrete time), and further selectively giving a sign following a value of the second bit string $\{y\}_2$ to this right-hand side, thereby to obtain a past retroactive internal status, the fourth step being sequentially executed by the number of bits of the second strings $\{y\}_2$; and

a fifth step of generating a compressed code $Y(-\tau)$ by giving an internal status $x(-\tau)$ retroactive to

the past obtained at step 4 and **m** to the right-hand side of an in-phase conversion quantization expression $Y(-\tau) = 2/\pi \times \arcsin(x(-\tau))^{1/2} \times 2^m$ (where **m** is a quantized resolution newly defined for the above **n**, and τ is a discrete time newly defined for the above **t**).

2. A compressed-code expanding method that is used for restoring and expanding a compressed code $Y(-\tau)$ generated by using the compressed-code generating method recited in Claim 1, the method comprising:

an eleventh step of obtaining an internal status $x(-\tau)$ that becomes an irrational number by giving the compressed code $Y(-\tau)$ and **n** to an inverse conversion expression of in-phase conversion quantization $x(-\tau) = \{\sin \pi\ Y(-\tau) / 2^{n+1}\}^2$ (where **n** is a quantized resolution);

a twelfth step of obtaining an internal status toward the future by giving the internal status $x(-\tau)$ to the right-hand side of forward calculation expressions of a logistic map

$$x(t+1) = 4x(t)\{1 - x(t)\} \quad \ldots(1)$$

$$x(t) = x(t + 1) \quad \ldots(2)$$

the twelfth step being executed repeatedly up to an internal status x(0);

a thirteenth step of restoring and expanding the second bit string $\{y\}_2$ by sequentially giving the internal status x(t) toward the future obtained at the twelfth step and **m** to the right-hand side of an in-phase conversion

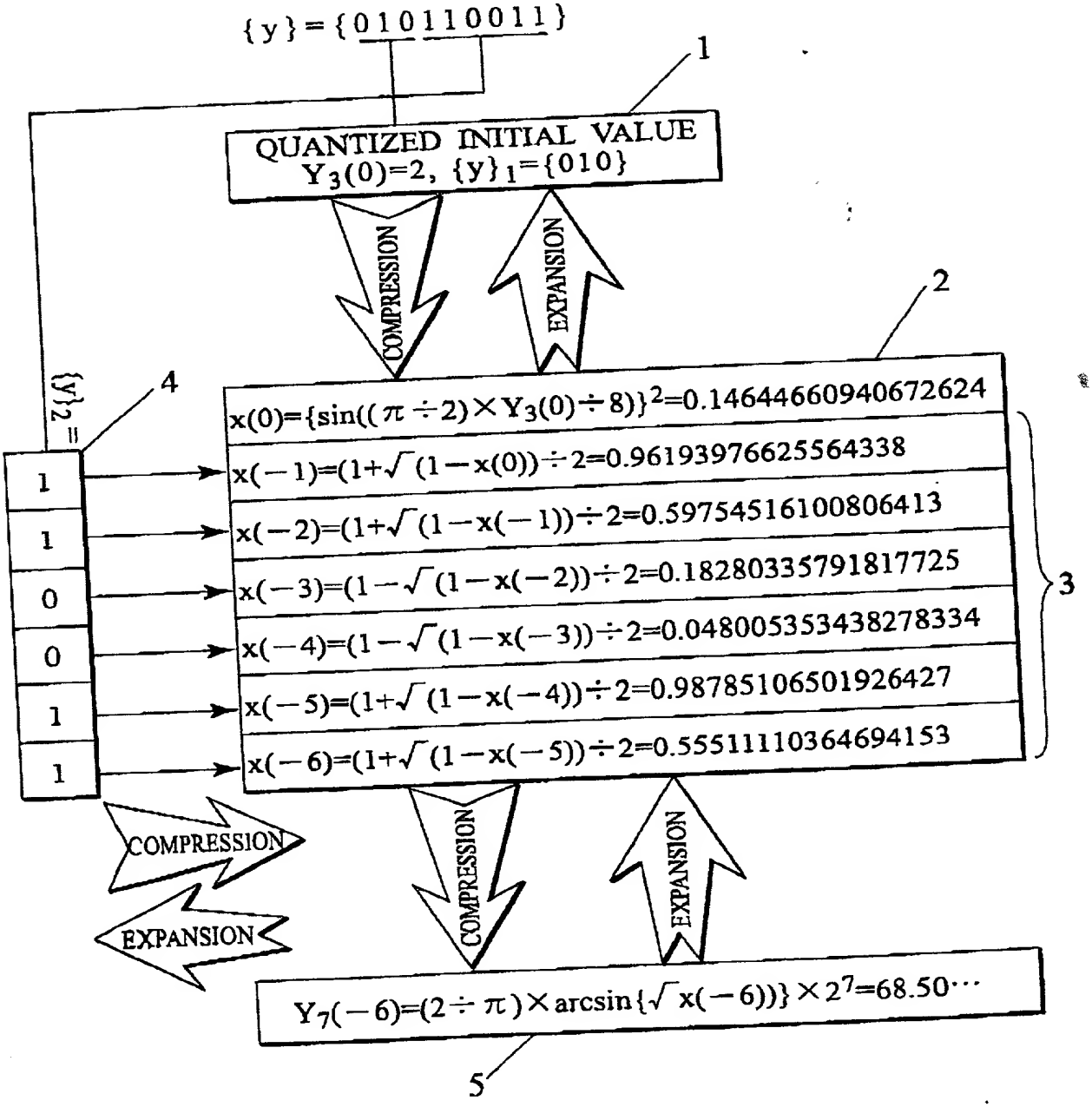
quantization expression $Y(t) = 2/\pi \times \arcsin(x(t))^{1/2} \times 2^m$ (where **m** is a quantized resolution newly defined for the above n, and **t** is a discrete time newly defined for the above τ); and

a fourteenth step of restoring and expanding the first bit string $\{y\}_1$ by sequentially giving the internal status x(0) toward the future obtained at the twelfth step and **m** to the right-hand side of the in-phase conversion quantization expression.

ABSTRACT

A compressed-code generating method that is used for compressing information on characters including numerical data, sound and images, and a compressed-code expanding method that is used for restoring and expanding the compressed code generated by using the compressed-code generating method to the original information. Bit strings $\{y\}_1$ and $\{y\}_2$ are obtained respectively from a bit string $\{y\}$ of information to be compressed. A reversible loop that exists in chaos is operated to these obtained bit strings, thereby to execute a reversible compression/expansion of the information using the chaos.

FIG.1


{y}={010110011}
1
QUANTIZED INITIAL VALUE
Y3(0)=2, {y}1={010}
COMPRESSION
EXPANSION
2
{y}2=
4
1
1
0
0
1
1
x(0)={sin((π÷2)×Y3(0)÷8)}2=0.14644660940672624
x(−1)=(1+√(1−x(0))÷2=0.96193976625564338
x(−2)=(1+√(1−x(−1))÷2=0.59754516100806413
x(−3)=(1−√(1−x(−2))÷2=0.18280335791817725
x(−4)=(1−√(1−x(−3))÷2=0.048005353438278334
x(−5)=(1+√(1−x(−4))÷2=0.98785106501926427
x(−6)=(1+√(1−x(−5))÷2=0.55511110364694153
3
COMPRESSION
EXPANSION
COMPRESSION
EXPANSION
Y7(−6)=(2÷π)×arcsin{√x(−6))}×27=68.50···
5

(Foreign associate use only)

DECLARATION AND POWER OF ATTORNEY

Attorney's Docket No. 44471/254367 (13700)

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name. I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: COMPRESSED-CODE GENERATING METHOD AND COMPRESSED-CODE EXPANDING METHOD, the specification of which

☐ is attached hereto.

☒ was filed on June 28, 2000 as U.S. Application or PCT International Application No. PCT/JP00/04262 and ~~xxxxxxxxxx~~ ~~xxxxxxxxxx~~ assigned U.S. Patent Application No. 09/786,138

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above. I do not know and do not believe that the same was ever known or used by others in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to the date of this application. I further state that the invention was not in public use or on sale in the United States of America more than one year prior to the date of this application. *I understand that I have a duty of candor and good faith toward the Patent and Trademark Office,* and I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate disclosing subject matter in common with the above-identified specification and having a filing date before that of the application on which priority is claimed:

Country	App. No.	Date of Filing	Priority Claimed Under 35 USC §119
Japan	P11-217647	June 28, 1999	Yes X No

I hereby claim the benefit under Title 35, United States Code, § 120 of any prior United States application(s), or §365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each claim of the present application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations §1.56, which became available between the filing date of the prior application and the national or PCT international filing date of this application:

Application No.	Filing Date	Status: patented, pending, abandoned

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statement were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patents issuing thereon.

I hereby authorize the U.S. attorneys named herein to accept and follow instructions from Miyoshi & Miyoshi, as to any action to be taken in the Patent and Trademark Office regarding this application, without direct communication between the U.S. attorney and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorney named herein will be notified by the undersigned.

POWER OF ATTORNEY: The following attorneys are hereby appointed to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Anthony B. Askew - 24,154; Roger T. Frost - 22,176; Robert E. Richards - 29,105; Stephen M. Schaetzel -31,418; Larry A. Roberts - 31,871; James Dean Johnson - 31,771; Leona G. Young - 37,266; Jamie L. Greene-32,467; Mary Anthony Merchant - 39,771; Brenda Ozaki Holmes - 40,339; Kimberly J. Prior - 41,483; Theodore M. Green - 41,801; John K. McDonald - 42,860; Suzanne Seavello Shope - 37,933; Sima Singadia Kulkarni - 43,732; Christopher J. Chan - 44,070; John M. Briski - 44,562; S. Craig Hemenway - 44,759; Paul E. Knowlton - 44,842; Charles E. Peeler - 45,004; Cheryl L. Huseman - 45,392; Shelby B. Grier - 45,785; Vaibhav P. Kadaba - 45,865; Donald R. Andersen - 28,280; Joseph Bennett-Paris - P47,226

Send correspondence to: **KILPATRICK STOCKTON, LLP**
2400 Monarch Tower, 3424 Peachtree Road, N.E.
Atlanta, GA 30326

Direct telephone calls **(404) 949-2400** to:
Roger T. Frost

Full name of sole or first inventor:	Katsufusa SHONO
Citizenship:	Japanese
Residence:	45-12, Shirane 5-chome, Asahi-ku, Yokohama-shi, Kanagawa 241-0005 Japan
Post Office Address:	Same as above
Inventor's signature	K. Shono Date: June 26, 2001

☒ Additional inventors are being named on separately numbered sheets attached hereto.

Full name of second joint inventor, if any: Takahiro ABE	2-a
Citizenship: Japanese	Jpx
Residence: c/o YAZAKI CORPORATION, 1500, Mishuku, Susono-shi, Shizuoka 410-1194 Japan	
Post Office Address: Same as above	
Inventor's signature Takahiro Abe	Date: June 26, 2001

Full name of third joint inventor, if any:	
Citizenship:	
Residence:	
Post Office Address:	
Inventor's signature	Date: